What is claimed is:

1. A modem coupling circuit for a power line carrier, which is connected to power lines for transmitting and receiving data, the modem coupling circuit comprising:

(a) a transformer having

a core including a gap formed therein,

primary windings constituting a bifilar wound coil which is wound around the core, forming a single layer; and

a secondary winding for transmission and a secondary winding for reception which hold the single layer of the primary windings therebetween from above and below;

(b) a coupling capacitor connected to a middle point between first ends of the primary windings having a bifilar construction such that the primary windings having a bifilar construction are serially connected to each other with their second ends being connected to the power lines respectively; and

(c) current limiting resistances connected to the primary windings having a bifilar construction respectively.

2. The modem coupling circuit for a power line carrier according to claim 1, wherein the transformer and the coupling capacitor are formed so as to satisfy first to fourth ranges,

the first range being a range of inductance which is large enough to fully satisfy a transmitter signal distortion characteristic and a noise distortion characteristic within a low frequency band of a transmission band for signals transmitted through the transformer;

the second range being a range of inductance which is small

enough to bear high current drive and great amplitude noise current;

the third range being a range of a combined value of inductance and coupling capacitance which value is large enough to allow a series resonance frequency of the inductance of the primary windings of the transformer and the coupling capacitor to be a low frequency outside the transmission band of the signals; and

the fourth range being a range of a combined value of a leakage inductance of the transformer and the coupling capacitance which value allows a series resonance frequency of the leakage inductance and the coupling capacitor to be within the transmission band.

3. The modem coupling circuit for a power line carrier according to claim 1, wherein the core, gap and windings of the transformer are formed and the value of the coupling capacitor is determined such that first to fourth ranges are satisfied,

the first range being a range of inductance by which a transmission signal distortion characteristic in a low frequency band of a transmission band of signals transmitted through the transformer and a noise distortion characteristic become 20 dB or more;

the second range being a range of inductance which bears a high current drive of 100 mA or more and a great amplitude noise current of 100 mA or more;

the third range being a range of a combined value of inductance and coupling capacitance by which a series resonance frequency of the inductance of the primary windings of the transformer and the coupling capacitor becomes lower than the frequencies of the transmission band of the signals; and

the fourth range being a range of a combined value of a leakage inductance of the transformer and the coupling capacitance which value allows a series resonance frequency of the leakage inductance and the coupling capacitor to be within the transmission band.

4. The modem coupling circuit for a power line carrier according to claim 1, wherein the gap in the core of the transformer is formed according to a permissible current value of the primary windings and an inductance by which a transmission signal distortion characteristic and a noise distortion characteristic become 20 dB or more.

5. The modem coupling circuit for a power line carrier according to claim 1, wherein the current limiting resistances are connected to the primary windings of the transformer, a transmitting circuit is connected to the secondary winding for transmission of the transformer through drive resistances, terminating resistances are connected to the secondary winding for reception of the transformer, and a receiving circuit is connected to the secondary winding for reception.

6. The modem coupling circuit for a power line carrier according to claim 1, wherein n of the turns ratio n : 1 of the secondary winding for transmission of the transformer to the primary windings of the transformer is set to about 2, and m of the turns ratio m : 1 of the secondary winding for reception to the primary windings is set to a value by which an environmental noise level becomes substantially equal to a floor noise level.

7. The modem coupling circuit for a power line carrier

according to claim 1, wherein the inductance of the transformer is set to 40 μH ± 10 μH by the provision of the gap of the core of the transformer.